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101ST CONGRESS
*2d Session*

SENATE

REPORT
101-462

# U.S. CAPABILITY TO MONITOR SOVIET COMPLIANCE WITH THE THRESHOLD TEST BAN TREATY (TTBT) AND THE TREATY ON PEACEFUL NUCLEAR EXPLOSIONS (PNET)

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Mr. BOREN, from the Select Committee on Intelligence, submitted the following

## REPORT

OF THE

## SELECT COMMITTEE ON INTELLIGENCE UNITED STATES SENATE

SEPTEMBER 14 (legislative day, SEPTEMBER 10), 1990.—Ordered to be printed

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U.S. GOVERNMENT PRINTING OFFICE

39-010 WASHINGTON : 1990

S423-3

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## REPORT

### SCOPE OF THE COMMITTEE'S EFFORT

The Senate Foreign Relations Committee has formal responsibility for reviewing all treaties before they are acted upon by the full Senate. The Senate Select Committee on Intelligence's role is to support this process by providing both the Foreign Relations Committee and the Senate as a whole with its assessment of the monitoring and counterintelligence issues raised by these treaties.

This report is the culmination of more than two years of research and analysis by the Committtee regarding the monitoring and counterintelligence issues raised by the two nuclear testing treaties. Along with its active promotion of enhanced monitoring capabilities during the annual intelligence authorization process, the Committee routinely follows arms control negotiations to keep abreast of such issues and then devotes intensive attention to them as agreement becomes more imminent. In October of 1988, when agreement on the new Protocols before the end of the Reagan Administration appeared possible, the Committee commissioned a series of formal on-the-record briefings for its staff. These briefings were provided in late 1988 and early 1989. A second set of on-the-record briefings was held in July of 1990, after the new Protocols were signed.

The Committee held a series of three hearings later in July, taking testimony from the Honorable Manfred Eimer, Assistant Director of the Arms Control and Disarmament Agency (testifying for ACDA Director Ronald F. Lehman II); Ambassador C. Paul Robinson, Chief U.S. Negotiator at the Nuclear Testing Talks; General Colin Powell, Chairman of the Joint Chiefs of Staff; Major General Gerald Watson, Director, Defense Nuclear Agency; the Honorable John C. Tuck, Under Secretary of Energy; Dr. Victor E. Alessi, Director DoE Office of Arms Control; Dr. John H. Nuckolls, Director, Lawrence Livermore National Laboratory; Dr. Siegfried Hecker,

Director, Los Alamos National Laboratory; Dr. Lawrence K. Gershwin, National Intelligence Officer for Strategic Programs (testifying for Director of Central Intelligence William H. Webster); Dr. John T. Kriese, Chairman, the Director of Central Intelligence's Joint Atomic Energy Intelligence Committee; Mr. Douglas J. MacEachin, Chief, the Director of Central Intelligence's Arms Control Intelligence Staff; Dr. William R. Graham, former Science Advisor to the President; and Dr. Wolfgang K. H. Panofsky, Director Emeritus of the Stanford Linear Accelerator Center. Additional U.S. officials submitted written testimony.

On August 2, 1990, the committe obtained an on-the-record staff briefing rgarding counterintelligence and security issues in the Treaties and U.S. preparedness to meet those challenges and to implement the verification provisions of the Protocols. Briefers at that session included: Brigadier General Roland Lajoie, Director, On-Site Inspection Agency; Mr. Harry B. Brandon, Deputy Assistant Director, Intelligence Division, Federal Bureau of Investigation; Dr. Victor E. Alessi of the Department of Energy; Mr. Jay Stewart, Director, Office of Counterintelligence, Department of Energy; Mr. James Magruder, Assistant Manager for Operations and Engineering, Nevada Test Site; Mr. Ray W. Pollari, Director of Counterintelligence Programs, Department of Defense; and Mr. John J. Bird, chief, the Director of Central Intelligence's Treaty Monitoring Center.

On September 19, 1988, the Committee requested that the Director of Central Intelligence produce a formal document, approved by the National Foreign Intelligence Board, on the ability of the U.S Government, through cooperative and unilateral means, to monitor Soviet compliance with the two Treaties. This requires led first to an analysis published by the Director of Central Intelligence's Joint Atomic Energy Intelligence Committee in July of 1989, and eventually to a National Intelligence Estimate published in July of 1990.

To maximize the usefulness of the National Intelligence Estimate, the Committee asked the Chairman of the Joint Chiefs of Staff to submit to the Director of Central Intelligence his assessment of the levels of Soviet evasion that he would consider militarily significant, and the Secretary of Energy to provide an assessment of the Soviet technical, logistic and programmatic requirements necessary to conduct such evasion. Thus, although the National Estimate is an intelligence document, it is directly relevant to the policy maker and reflects the combined expertise of many agencies in the Executive branch, with input from the National Laboratories.

The Committee has also received numerous responses to questions for the record that were submitted to the Executive branch after its July hearings and briefings regarding the two treaties. The results of these inquiries have been integrated into this report. In addition, the Committee staff has traveled extensively to visit U.S. facilities involved with nuclear tests and nuclear test monitoring: the Lawrence Livermore, Los Alamos and Sandia National Laboratories; the Nevada Test Site; the Air Force Technical Applications Center (AFTAC) facility at Patrick Air Force Base in Flori-

da; and the AFTAC facility at McLellan Air Force Base in California.

Finally, the Committee solicited and obtained the written views of numerous outside experts in arms control, seismology, and nuclear testng fields.

The culmination of this intensive effort is a classified report of over 100 pages, which addresses in detail the verification Protocols, U.S. collection and analytical capabilities, cooperative verification measures, Soviet compliance, evasion scenarios, monitoring judgments, safeguards, counterintelligence issues, and implementation concerns. The following are key unclassified findings from the classfied report.

## INTRODUCTION TO THE TTBT AND PNET

On June 1, 1990, in Washington, D.C., Presidents Bush and Gorbachev signed new verification protocols for two previously-signed but unratified treaties—the Threshold Test Ban Treaty of 1974 and the Peaceful Nuclear Explosions Treaty of 1976—that place a 150-kiloton limit on the yield of underground nuclear explosions.

The 150-kiloton limit embodied in the TTBT and the PNET is part of the decades old effort to place restrictions on nuclear testing. In his prepared testimony before the Select Committee on Intelligence on July 19, Ambassador C. Paul Robinson, who negotiated the treaty protocols, stated:

> You may recall that in the 50's and 60's the U.S. conducted nuclear weapon tests with yields many times greater than 150 kilotons. The Soviet Union conducted tests with even higher yields. Thus, the yield limitation imposed by the Treaties is a significant limitation. The arms control rationale for imposing such a yield limitation was to prevent, or at least restrain, the development of very high-yield weapons.

The Treaty on the Limitation of Underground Nuclear Weapons Tests, more commonly known as the Threshold Test Ban Treaty (TTBT), was signed on July 3, 1974. The new Protocol to the Treaty requires that each party specify the geographic boundaries of each weapons test site, provide certain geological and other data about the site, allow the Verifying Party the right to on-site hydrodynamic shock wave measurements and in-country seismic measurements for tests above 50 kilotons, and allow the Verifying Party to conduct on-site inspections for all tests above 35 kilotons. The TTBT covers all underground nuclear explosions that occur at designated weapons test sites, while the separate PNE Treaty applies to any such explosions away from these sites.

The TTBT provisions do not apply to underground nuclear explosions for peaceful purposes (peaceful nuclear explosions or PNEs) because, at the time it was signed, the Soviets insisted on the right to carry our large-scale PNEs that might require explosions larger than 150 kilotons. The Treaty on Underground Nuclear Explosions for Peaceful Purposes (or Peaceful Nuclear Explosions Treaty—PNET) was signed on May 28, 1976. The PNET provides for the right to carry out multiple, or "group," explosions with a total yield of up to 1,500 kilotons, but only if the yield of any individual explosion involved does not exceed 150 kilotons and if (for group

PNEs with aggregate yields above 150 kilotons) the Verifying Party approves of verification procedures for the PNE. All group PNEs with aggregate yields above 50 kilotons must be carried out in such a way that the individual explosions involved can be identified and measured.

The new Protocol to the PNET spells out the procedures to be used to ensure that no individual explosion exceeds 150 kilotons. The most important method involves estimating the yield by using on-site equipment to measure the hydrodynamic shock wave from the explosion of devices above 50 kilotons (or of each explosion in a group PNE with a total planned yield over 50 kilotons). For group explosions with total planned yield over 150 kilotons, a local seismic network would also be used to detect each explosion.

Although the TTBT and PNET are separate treaties, they are intimately linked and have the same basic purpose—to prohibit explosions exceeding 150 kilotons. The U.S. approach to the PNET was based on the presumption that there is no essential distinction between the technology of a nuclear explosive device that would be used as a weapon and one that would be used for a peaceful purpose. For this reason, any TTBT limits on weapons tests had to apply equally to tests for peaceful purposes.

Similarly, the basic monitoring requirement of the TTBT and the PNET is the same—to determine whether explosions with yields in excees of 150 kilotons have occurred. In assessing the U.S. Government's ability to do this, it does not matter whether the explosion in question is considered a weapons test or a PNE.

## BACKGROUND TO THE COMMITTEE'S FINDINGS

When the TTBT and PNET were signed in 1974 and 1976, respectively, U.S. policymakers planned to rely on "national technical means of verification" to verify compliance with the TTBT. This meant using sites outside the Soviet Union to record the seismic waves generated by an explosion and then estimating the yield of the explosion based on the size of the seismic signal.

Successive Administrations judged, however, that such means were insufficient to verify Soviet compliance with high confidence, largely because of inherent uncertainties in seismic estimates of Soviet test yields. Moreover, serious concerns arose about possible Soviet violations of the TTBT and the risk of undetected evasion. As a consequence, the Senate did not provide its advice and consent to ratification and the Executive branch worked to improve its monitoring capabilities and, since the mid-1980's, to develop new verification Protocols to the Treaties.

In recent years, U.S. Government experts have gained increasing knowledge of the geology of the Soviet test sites, have developed new analytical methods and have calibrated their seismic efforts with on-site measurements, all of which have reduced their uncertainties and resulted in lower seismic estimates of the yields of current and past Soviet tests. In addition, the new verification Protocols to the Treaties address both the uncertainty problem associated with estimating nuclear yields and the risks of Soviet evasion.

With regard to the uncertainty problem, on-site inspection will provide geological data that are crucial to the analysis of how well

seismic signals will be generated and transmitted from an explosion site. In-country seismic monitoring will improve U.S. collection of regional seismic signals, although this may make only a minor contribution to U.S. monitoring confidence. On-site (hydrodynamic) monitoring will provide an independent and, generally, a more accurate estimate of explosive yield, which will reduce the uncertainty in "all-source" estimates of yield and also contribute to the refinement of seismic equations, thus lowering the uncertainty attached to yield estimates that are based only on seismic data.

The Protocols will also make evasion much more difficult. Thus, on-site inspectors will be able to detect the use of large cavities or porous material to reduce the size of the seismic signals emitted by a nuclear explosion. This means that any evasion scheme using those methods would have to depress the apparent yield of an explosion to near 35 kilotons, rather than merely to near 150 kilotons—a much more daunting challenge. On-site hydrodynamic monitoring similarly protects against evasion, by forcing the evader to contend with more than just seismic monitoring. A scheme that might reduce a test's apparent yield in seismic monitoring will be fruitless unless it can either depress the apparent yield to near 50 kilotons or also fool the hydrodynamic monitors that measure the shock wave as close as 35 feet from the explosion.

Several other Protocol provisions are specifically designed to thwart evasion: a limit on the size of cavities of nuclear tests; limits on closely-spaced nuclear tests; local seismic monitoring of group PNEs with a declared aggregate yield over 150 kilotons, to detect any undeclared explosion; and the requirement that the Verifying Party agree to verification measures for any group PNE with that large a declared aggregate yield.

There will still be some uncertainties in U.S. monitoring, although U.S. experts could not think of a reason why the Soviets would want to engage in the minor violations of the 150-kiloton limit that exploitation of those uncertainties (without a major evasion effort) would—with some risk—permit. There are also still evasion scenarios that one could envision (as described in this report), although they are much more time-consuming, costly and risky than without the new Protocols. Finally, there may well be means of evading the 35-kiloton and 50-kiloton trigger levels, if the only goal of the Soviets is to avoid U.S. access to a test that exceeds those limits but is still well below 150 kilotons.

## KEY FINDINGS AND RECOMMENDATIONS

### *Basic Monitoring Judgments*

1. As as result of the cooperative monitoring and inspection measures negotiated with the Soviets and recent improvements in U.S. analytical methodologies, the overall U.S. capability to monitor Soviet compliance with the 150-kiloton limits in the Threshold Test Ban Treaty (TTBT) and the Peaceful Nuclear Explosions Treaty (PNET) has been significantly improved.

2. The Committee concludes that unilateral U.S. capabilities and the cooperative measures provided for in the verification Protocols are sufficient to monitor Soviet compliance with the 150-kiloton limits.

3. The Soviets could conduct tests slightly above the the 150-kiloton limits without the U.S. Government being certain that they had done so. The Soviets could not evade the 150-kiloton limits by a significant amount, without a lengthy, costly and risky convert evasion effort.

4. It will be more difficult to monitor Soviet compliance with the 35-kiloton and 50-kiloton "trigger levels" for on-site inspection and hydrodynamic or in-country seismic monitoring. These trigger levels will still serve their primary purpose, however, of making any major evasion of the 150-kiloton limits a much more daunting task for the Soviets.

*Soviet Incentives to Comply or to Evade*

5. The primary motivations for Soviet evasion would be to conduct full-yield tests to validate the performance, reliability or safety of old or new weapons, or to preclude U.S. knowledge of Soviet exotic weapons programs.

6. These motivations are offset by Soviet reliance on proven nuclear weapon designs; by the fact that most nuclear testing needs can be met by test under 150 kilotons; by the high costs of covert evasion; by the uncertainty that any evasion scenarios would work as intended; and by the risk of detection by the United States or revelation by an increasingly open and anti-nuclear Soviet press and society. The cost, risk and uncertainty factors would all increase if more than one illegal test were attempted.

*Evasion Scenarios*

7. Although the motivations and risks described above did not lead any Executive branch witnesses to expect the Soviet Union to attempt any evasion of the Treaties, the following evasion scenarios were presented as examples of the most feasible approaches:

a. The Soviets could attempt an unannounced 300-kiloton explosion in a large cavity to reduce the seismic signal generated by the explosion, and thus the estimated yield, to near the 35-kiloton trigger level for on-site inspection. Covert construction of such a cavity would be a major activity costing hundreds of millions of dollars, requiring years to create and still running the risk of being detected.

b. Because the TTBT Protocol does not restrict the timing or separation of any tests below 35 kilotons, the Soviets could conduct multiple tests that would degrade seismic estimates of yield. Multiple-explosion evasion scenarios appear more feasible regarding the trigger levels than for any significant evasion of the 150-kiloton limit.

c. Testing in deep space, a violation primarily of the Limited Test Ban Treaty of 1963, is the only technically feasible method of completely concealing the occurrence of a large nuclear explosion. The Soviets would not only have to fly a nuclear payload and testing equipment deep into space and be willing to pay the cost, but would also have to develop an adequate cover story for the mission and for their retrieval of testing

data at a time when they are increasingly open about their scientific space missions.

*Past Soviet Compliance*

8. Given current U.S. Government estimates of the yields of past nuclear tests, the Committee can rule out any major Soviet violation of the 150-kiloton limits of 1976. The pattern of past Soviet testing is consistent with either of two other hypotheses: Soviet compliance with the 150-kiloton limit; or a few slight violations of it. The military rationale for slight violations remains in doubt.

9. The inability of the U.S. Government to determine whether the Soviets had or had not violated the 150-kiloton limits was sufficient reason for the United States to negotiate more stringent verification protocols.

*Implementation and Counterintelligence*

10. The Executive branch has made sensible decisions on organization and policy for implementing the verification Protocols, analyzing the resulting data, producing monitoring estimates and reaching verification judgments.

11. There is a threat of Soviet intelligence exploitation of the inspection process, including efforts to compromise the secrecy of U.S. nuclear weapons and defense programs and to target U.S. inspectors in the Soviet Union.

12. No comprehensive interagency risk assessment has yet been completed. The risks at the Nevada Test Site and at potential locations for housing Soviet inspectors have not been fully evaluated, partly because not all relevant Executive branch elements have participated adequately in the assessments.

13. The Executive branch has not yet resolved major issues of funding for implementation and counterintelligence. While the President could postpone exchanging instruments of ratification until funds for implementation are available, the mere availability of funds will not guarantee that the several agencies involved will have the needed counterintelligence resources in place before the first inspection occurs.

*Protocol Changes*

14. The TTBT Protocol contains not only the basic monitoring rights, but also other provisions affecting monitoring capabilities that are essential for effective verification. They include those that specify data to be provided by the Testing Party; assure the reliability of CORRTEX monitoring; set the criteria for "standard" nuclear tests; and list the permitted activities and equipment of inspectors and monitors.

15. The TTBT Protocol also contains provisions that are essential for effective counterintelligence. They include provisions requiring the use of anti-intrusiveness devices and giving the United States the right to escort Soviet personnel at all times; to control the travel and contacts of Soviet personnel; to examine any equipment brought to the United States; and to inspect the baggage, personal belongings and packages brought or mailed by Soviet personnel.

16. These provisions are subject to change by the Bilateral Consultative Commission established pursuant to paragraphs 2–4 of Section XI of the TTBT Protocol. Executive branch statements thus far do not provide sufficient assurance that changes in such essential provisions will be subject to the advice and consent of the Senate.

*Recommendations*

1. The Executive branch should provide firm assurances that any changes in the TTBT Protocol regarding provisions that are essential for effective U.S. monitoring, counterintelligence or security—such as those listed above—will be treated as amendments to the Protocol that are subject to the advice and consent of the Senate. The Committee recommends that a condition to the instrument of ratification be enacted to buttress those assurances.

2. The Executive branch should also assure the Senate that it will provide the Senate Intelligence Committee prior notice of any other proposed change in the TTBT Protocol that may have a negative impact on U.S. monitoring, counterintelligence or security capabilities, to enable the Committee to voice an objection in appropriate cases, before the issue becomes moot. The Committee recommends that a condition to the instrument of ratification be enacted to protect the interests of all relevant Committees of the Senate.

3. The Parties agree, in paragraph 3 of Article I of the TTBT, to "continue . . . negotiations with a view toward achieving a solution to the problem of the cessation of all underground nuclear tests." The Committee did not consider whether the United States should negotiate further constraints on nuclear tests, but supports further research into technologies that may contribute to verification of compliance with any new obligations the United States may undertake.

4. The Executive branch should complete a comprehensive risk assessment immediately. In conjunction with that assessment, relevant agencies should inform the Intelligence Committees of their plans for effective counterintelligence and security countermeasures.

5. The Committee recommends that a condition to the instrument of ratification be enacted requiring that the President not exchange instruments of ratification until he certifies to the Senate that sufficient resources and time are available to prepare for TTBT implementation, including counterintelligence and security countermeasures.

## ADDITIONAL VIEWS OF SENATOR JOHN GLENN

I fully support the findings and recommendations of the Senate Select Committee on Intelligence (SSCI) report on the Threshold Test Ban Treaty (TTBT) of 1974 and the Peaceful Nuclear Explosions Treaty (PNET) of 1976, and I commend the Committee for its thorough and balanced assessment of the monitoring and counterintelligence aspects of these treaties.

I would like to express some additional views not only on the TTBT and the PNET, but on the issue of additional limitations on nuclear testing as well.

My first concern relates to the nuclear testing Safeguards. The Safeguards of the Limited Test Ban Treaty (LTBT), which bans nuclear tests in the atmosphere, in outer space, and underwater, represent conditions by the U.S. Senate to the ratification of that treaty in August 1963. These Safeguards originated when the Joint Chiefs of Staff (JCS) concluded that the military risks inherent in the LTBT were acceptable only if adequate Safeguards were established. The purpose of these Safeguards is basically to hedge against Soviet violation or abrogation of the treaties by maintaining a U.S. capability to respond with actions in the nuclear testing and weapons development fields. When President Bush transmitted the TTBT and PNET verification protocols to the Senate for its advice and consent earlier this year, he reaffirmed his support for the Safeguards and is seeking Senate endorsement of the Safeguard regime for these treaties.

I am a strong supporter of the contingency planning that is embodied in the Safeguards. Recent disclosures, however, have raised doubts in my mind about the continued need for one of these Safeguards—the so-called "Safeguard (c)." Safeguard (c) mandated the maintenance of the facilities and resources necessary to promptly institute nuclear tests in the atmosphere should they be deemed essential to our national security or should the treaty or any of its terms be abrogated by the Soviet Union.

It is now widely recognized that nuclear weapons tests conducted in the atmosphere pose significant health and environmental risks. The Senate recently passed legislation providing compensation for people exposed to fallout from weapons testing in Nevada. In the Marshall Islands, where the U.S. exploded some 66 tests, the health and environmental legacy is still unfolding with tragic consequences.

The Marshall Islands medical program was integrated into this test readiness safeguard in 1982, raising serious policy and management questions. This integration resulted in the effective deregulation of radiation health and safety policies in the Marshall Islands. Fortunately, Energy Secretary James Watkins has recognized this problem and is taking steps to correct it.

I believe that a comprehensive evaluation of Safeguard (c) should be undertaken to determine its continued relevance. This evaluation should include as assessment of the costs of resuming atmospheric nuclear testing, an assessment of the health and environmental impacts of resumed atmospheric testing, and an assessment of whether circumstances could ever arise under which atmospheric testing could be deemed essential to our national security.

In addition, I believe it is important to place these two treaties in their broader arms control context. Both the PNET and the TTBT, which place a 150 kiloton (kt) limit on the yield of U.S. and Soviet underground nuclear tests, are an interim step toward the ultimate goal of attaining a complete ban of all nuclear tests. Final Senate action on the TTBT and the PNET will represent the only tangible results of the effort to attain the ultimate goal of a Comprehensive Test Ban Treaty (CTBT) since negotiation of the Limited Test Ban Treaty (LTBT) in 1963.

Over the years, I have joined with many of my colleagues in the Congress in calling upon the President to request Senate retification of the TTBT and the PNET, and to resume negotiations toward conclusion of a Comprehensive Test Ban Treaty. I am pleased that these treaties will at long last be acted upon by the Senate. Paragraph 3 of Article I of the TTBT commits the superpowers to "continue their negotiations with a view toward achieving a solution to the problem of the cessation of all underground nuclear weapon tests." I hope that with Senate ratification of the TTBT and the PNET, the U.S. and the Soviet Union will immediately engage in serious negotiations to further limit and ultimately cease nuclear testing in the near future.

At issue in the debate over limiting and ultimately terminating nuclear testing is whether such additional restrictions are desirable from a national security standpoint. A comprehensive test ban (CTB) would result in precluding deployment of nuclear warheads that are significantly different from those currently in our inventory; curtail modifications to nuclear warheads; constrain deployment of nuclear delivery systems by impeding warhead design; and prevent deployment of future generation nuclear weapons. In short, a nuclear test ban would place qualitative (as opposed to quantitative) limits on the nuclear arms race. Coupled with quantitative reductions in nuclear warheads by the superpowers, I believe a CTB will go a long way toward reducing the threat of nuclear war.

I believe that a comprehensive test ban would also serve to enhance our nation's long-standing interest in preventing the proliferation of nuclear weapons to other nations. The proliferation of nuclear weapons is one of the most ominous national security threats facing the U.S. today. Iraq's attempt earlier this year to obtain trigger devices to aid its nuclear program, and the growing threat of war between India and Pakistan (both of which have nuclear programs and delivery systems of great concern to the U.S.), underscore the gravity of this problem. A U.S.-Soviet nuclear test ban, leading to a multilateral test ban, would help to establish a global norm of "non-testing" that would raise the political cost of acquiring nuclear weapons. This non-testing standard could well

tip the balance against proliferation in key nuclear threshold states.

The preamble to the Treaty on the Non-Proliferation of Nuclear Weapons, also known as the Non-Proliferation Treaty (NPT) recalls the LTBT of 1963 to ". . . seek to achieve the discontinuance of all test explosions of nuclear weapons for all time and to continue negotiations to this end . . . " The NPT comes up for renewal in 1995, and under Article VI of the Treaty the nuclear weapons states are committed to pursue "effective measures relating to the cessation of the nuclear arms race at an early date."

The NPT will only be renewed if a majority of its parties conclude that the Treaty continues to promote their national security interests. If the superpowers continue to rationalize their respective nuclear weapon modernization programs by arguing that modernization rather than restraint is necessary for their national security, a growing number of Third World nations are certain to justify their pursuit of a nuclear weapon capability on the same basis. Such an outcome would not only undermine efforts to broaden nonproliferation controls, but could erode the current non-proliferation regime. In short, a Comprehensive Test Ban Treaty is widely perceived as a prerequisite for preventing the emergence of additional nuclear weapon states as well as preserving the NPT regime.

What is the best approach for attaining a CTBT? For a number of years, I have advocated an approach recommended by seismologists Paul G. Richards and Allan Lindh who have put forward what I believe to be a realistic approach toward attaining a Comprehensive Test Ban Treaty. This would involve the superpowers first negotiating a Low-Yield Threshold Test Ban Treaty. Such a treaty would require that the U.S. and the Soviet Union not conduct nuclear tests with yields in excess of approximately 15 kilotons, and would require them to commit themselves to lowering this threshold in stages over a period of several years. (With the establishment of a sufficient number of in-country monitoring facilities, many experts believe that the uncertainties of estimating the yields of nuclear tests at 15 kilotons are not likely to be much different than they are for the 150 kiloton threshold of the current threshold treaty). Additionally, the superpowers would commit themselves to reaching a very low yield of 1 kiloton in the foreseeable future. A Comprehensive Test Ban Treaty would be the ultimate goal of such negotiations.

A staged "test down" treaty leading toward a CTB would address uncertainties about verification. In-country monitoring under this approach would allow both the U.S. and Soviet Union the opportunity to build up a needed data base of seismic information about each other. Concrete demonstration of monitoring capabilities would be made prior to a decision to move to a lower threshold in order to ensure that each threshold reduction would result in a still-verifiable treaty.

I believe that the approach I have outlined for attaining a Comprehensive Test Ban Treaty with the Soviet Union is both reasonable and responsible. As the superpowers make a renewed effort toward attaining this important goal. I hope that this approach is seriously pursued.

Finally, I would note that the TTBT and the PNET are the first of a series of arms control agreements that will require Senate advice and consent within the next few years. These agreements will provide an important measure of predictability and stability to the superpower relationship—but only if monitoring concerns are adequately addressed.

These arms control agreements will undoubtedly be far more complex than either the TTBT or the PNET and will therefore present formidable monitoring challenges. Enormously expensive intelligence systems that are necessary to monitor Soviet compliance with these agreements constitute the hidden cost of arms control. If these essential intelligence capabilities are sacrificed to narrow budgetary considerations, our ability to adequately monitor these agreements will be placed at risk—endangering our nation's security as well as the public's support of the arms control process.

As the Administration approaches the conclusion of additional arms control agreements with the Soviet Union, I hope it is taking into account the need for a robust research and development program for arms control monitoring technologies—as well as the need for a robust budget to pay for these technologies.

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